

Robust Switching Control for Hypersonic Vehicles, Phase I

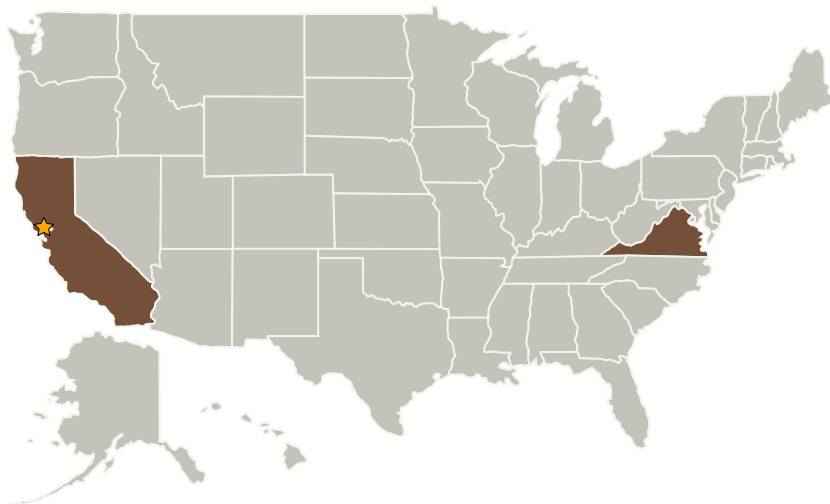
Completed Technology Project (2009 - 2009)



Project Introduction

Flight in the hypersonic regime is critical to NASA's goals because access to earth orbit and re-entry from orbit to earth or to other planets with atmospheres require flight through this regime. Hypersonic flight poses a wide array of difficulties, including significant guidance and control challenges. For example, flexible airframes and highly integrated airframe and propulsion systems common in scramjet designs mean that aerodynamic and propulsion control are closely coupled. Control laws for hypersonic vehicles must also handle a very broad range of dynamics as hypersonic vehicles often operate from subsonic through hypersonic speeds and possibly with multiple propulsion modes for different speed ranges. Actuator saturation and significant models uncertainty also pose control challenges, and demanding energy management requirements make guidance and trajectory optimization challenging tasks as well. The proposed research will develop innovative control strategies to address the challenges of hypersonic flight. These will be based on recent advances in switching control methods that provide large stable regions and disturbance rejection guarantees in the presence of actuator saturation. The proposed control methods will ultimately be integrated with advanced guidance approaches for hypersonic vehicles developed by Barron Associates.

Primary U.S. Work Locations and Key Partners



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Ames Research Center (ARC)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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Organizations Performing Work	Role	Type	Location
★ Ames Research Center(ARC)	Lead Organization	NASA Center	Moffett Field, California
Barron Associates, Inc.	Supporting Organization	Industry	Charlottesville, Virginia

Primary U.S. Work Locations	
California	Virginia

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.1 Aeroassist and Atmospheric Entry
 - └ TX09.1.2 Hypersonic Decelerators